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| FORM PTO-1390 (Modified) (REV 11-98) | | U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE | ATTORNEY'S DOCKET NUMBER 112740-138 |
| TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371 | | | U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 09/720447) |
| INTERNATIONAL APPLICATION NO. PCT/DE99/01219 | INTERNATIONAL FILING DATE 22 April 1999 | PRIORITY DATE CLAIMED 22 June 1998 | |
| TITLE OF INVENTION METHOD AND BASE STATION FOR THE TRANSMISSION OF ORGANIZATION INFORMATION ITEMS IN A RADIO COMMUNICATIONS SYSTEM | | | |
| APPLICANT(S) FOR DO/EO/US Michael Benz et al. | | | |
| Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information: | | | |
| <ol style="list-style-type: none"> 1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. 2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. 3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1). 4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date. 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371 (c) (2)) <ol style="list-style-type: none"> a. <input checked="" type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> has been transmitted by the International Bureau. c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). 6. <input checked="" type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)). 7. <input checked="" type="checkbox"/> A copy of the International Search Report (PCT/ISA/210). 8. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3)) <ol style="list-style-type: none"> a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> have been transmitted by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input type="checkbox"/> have not been made and will not be made. 9. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). 10. <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)). 11. <input type="checkbox"/> A copy of the International Preliminary Examination Report (PCT/IPEA/409). 12. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)). | | | |
| Items 13 to 20 below concern document(s) or information included: | | | |
| <ol style="list-style-type: none"> 13. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. 14. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. 15. <input checked="" type="checkbox"/> A FIRST preliminary amendment. 16. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. 17. <input type="checkbox"/> A substitute specification. 18. <input type="checkbox"/> A change of power of attorney and/or address letter. 19. <input checked="" type="checkbox"/> Certificate of Mailing by Express Mail 20. <input checked="" type="checkbox"/> Other items or information: | | | |
| Submission of Drawings Figs. 1-9 on 5 sheets <div style="border: 1px solid black; height: 100px; width: 100%;"></div> | | | |

| | | |
|--|--|---|
| U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 09/720447) | INTERNATIONAL APPLICATION NO. PCT/DE99/01219 | ATTORNEY'S DOCKET NUMBER 112740-138 |
|--|--|---|

21. The following fees are submitted:

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

- ☐ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO **\$1,000.00**
- ☒ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **\$860.00**
- ☐ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO **\$710.00**
- ☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) **\$690.00**
- ☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) **\$100.00**

ENTER APPROPRIATE BASIC FEE AMOUNT =**\$860.00**

Surcharge of **\$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).

\$0.00

| CLAIMS | NUMBER FILED | NUMBER EXTRA | RATE | | |
|--------------------|--------------|--------------|-----------|---------------|--|
| Total claims | 11 - 20 = | 0 | x \$18.00 | \$0.00 | |
| Independent claims | 2 - 3 = | 0 | x \$80.00 | \$0.00 | |

Multiple Dependent Claims (check if applicable) . ☐**\$0.00****TOTAL OF ABOVE CALCULATIONS =****\$860.00**

Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable) . ☐

\$0.00**SUBTOTAL =****\$860.00**

Processing fee of **\$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).

\$0.00**TOTAL NATIONAL FEE =****\$860.00**

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). ☐

\$0.00**TOTAL FEES ENCLOSED =****\$860.00**

| | |
|---------------|----|
| Amount to be: | \$ |
| refunded | |
| charged | \$ |

☒ A check in the amount of **\$860.00** to cover the above fees is enclosed.

☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees.
A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **02-1818** A duplicate copy of this sheet is enclosed

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

William E. Vaughan
Bell, Boyd & Lloyd LLC
P.O. Box 1135
Chicago, Illinois 60690

SIGNATURE

William E. Vaughan

NAME

39,056

REGISTRATION NUMBER

December 22, 2000

DATE

BOX PCT

IN THE UNITED STATES ELECTED/DESIGNATED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

5

PRELIMINARY AMENDMENT

APPLICANTS: Michael Benz et al.

DOCKET NO: 112740-138

SERIAL NO:

GROUP ART UNIT:

10

EXAMINER:

INTERNATIONAL APPLICATION NO:

PCT/DE99/01219

INTERNATIONAL FILING DATE:

22 April 1999

INVENTION: METHOD AND BASE STATION FOR THE
TRANSMISSION OF ORGANIZATION INFORMATION
ITEMS IN A RADIO COMMUNICATIONS SYSTEM

15

Assistant Commissioner for Patents,
Washington, D.C. 20231

20

Sir:

Please amend the above-identified International Application before entry
into the National stage before the U.S. Patent and Trademark Office under 35 U.S.C.
§371 as follows:

In The Specification:

25

On page 1, cancel lines 1-5 and substitute the following therefor:

--SPECIFICATION

TITLE

**METHOD AND BASE STATION FOR THE TRANSMISSION OF
ORGANIZATION INFORMATION ITEMS IN A RADIO
COMMUNICATIONS SYSTEM**

30

BACKGROUND OF THE INVENTION

Field of the Invention--.

On page 1, line 7, insert --present-- before "invention".

On page 1, before line 13, insert the following:

--Description of the Prior Art

DE 196 29 899 C describes a mobile radio system in which a bidirectional logic control channel LCCH is set up between a base station and a mobile station in a specific time slot. If there are no longer enough time slots available for additional traffic channels, the transmission of the LCCH is suppressed and, instead of this, a traffic connection is set up in the relevant time slot. This situation occurs during a soft handover, for example. If no additional capacity for traffic channels is required, in principle the LCCH is transmitted in its time slot. The bidirectional LCCH is transmitted in a point-to-point connection.--

On page 1, line 14, insert a --,-- after "example.

On page 1, line 22, cancel "envisaged" and substitute therefor --envisioned--.

On page 1, line 24, cancel the ",", and substitute therefor a --;--.

On page 1, line 24, insert a ",", after "example".

On page 1, line 29, cancel "for supplying" and substitute therefor --to supply--.

On page 1, line 30, cancel "are" and substitute therefor --is--.

On page 2, line 3, cancel the ",", and substitute therefor a --;--.

On page 2, line 3, insert a --,-- after "i.e.".

On page 2, line 17, cancel the ",", and substitute therefor a --;--.

On page 2, line 17, insert a --,-- after "example".

On page 2, line 21, insert --present-- before "invention".

On page 2, lines 21, 22, cancel "based on the object of specifying" and substitute therefor --, thus, directed to--.

On page 2, cancel lines 24-27.

On page 2, before line 28, insert the following centered heading:

--SUMMARY OF THE INVENTION--

On page 2, line 28, insert --present-- before "invention".

- On page 2, line 28, insert --therefore,-- after the “,”.
- On page 3, line 2, cancel the “,” and substitute therefor a --;--.
- On page 3, line 2, insert --, for example,-- after “say”.
- On page 3, line 3, cancel “e.g.”.
- 5 On page 3, line 10, insert --present-- before “invention”.
- On page 3, line 13, cancel the “,”.
- On page 3, line 14, insert a --(-- before “i.e.”.
- On page 3, line 14, insert a --,-- after “i.e.”.
- On page 3, line 15, insert a --)-- after “method”.
- 10 On page 3, line 15, cancel the “,” after “continuously”.
- On page 3, line 15, insert a --(-- before “e.g.”.
- On page 3, line 15, insert a --,-- after “e.g.”.
- On page 3, line 16, insert a --)-- after “methods”.
- On page 3, line 17, cancel “According to refinements” and substitute
- 15 therefor --In alternative embodiments--.
- On page 3, line 17, insert --present-- before “invention”.
- On page 3, line 27, cancel the “,” and substitute therefor a --;--.
- On page 3, line 27, insert a --,-- after “e.g.”.
- On page 3, line 36, cancel “e.g.” and substitute therefor --such as--.
- 20 On page 3, line 37, cancel “can”.
- On page 3, line 37, insert --can-- after “also”.
- On page 4, line 1, cancel “instance” and substitute therefor --embodiment--.
- On page 4, line 2, insert --present-- before “invention”.
- On page 4, line 3, cancel “on” and substitute therefor --upon--.
- 25 On page 4, line 11, insert --present-- before “invention”.
- On page 4, line 16, cancel “time division duplex” and substitute therefor --
- Time Division Duplex--.
- On page 4, line 18, cancel the “,” and substitute therefor a --;--.
- On page 4, line 18, insert a --,-- after “e.g.”.

On page 4, line 19, cancel “, and” and substitute therefor --. Moreover--.

On page 4, line 20, cancel “can” and substitute therefor --this system--.

On page 4, line 20, insert --can-- after “also”.

On page 4, line 21, cancel the “,” after “services” and substitute therefor --
5 without wasting radio resources;--.

On page 4, line 21, insert a --,-- after “e.g.”.

On page 4, line 27, cancel the “,”.

On page 4, cancel lines 30-33 and substitute the following therefor:

--Additional features and advantages of the present invention are described
10 in, and will be apparent from, the following Detailed Description of the Preferred
Embodiments and the Drawings.

DESCRIPTION OF THE DRAWINGS--

On page 4, line 35, cancel the “,” and substitute therefor a --;--.

On page 4, line 39, cancel the “,” and substitute therefor a --;--.

15 On page 4a, line 2, cancel the “,” and substitute therefor a --;--.

On page 5, line 3, cancel the “,” and substitute therefor a --;--.

On page 5, line 5, cancel the “,” and substitute therefor a --;--.

On page 5, before line 8, insert the following centered heading:

--DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS--

20 On page 5, line 8. insert a --,-- after “1”.

On page 5, line 9, insert a --,-- after “system”.

On page 5, line 10, cancel “comprises” and substitute therefor --includes--.

On page 5, line 11, insert --which-- after “and”.

On page 5, line 15, insert a --,-- after “RNM”.

25 On page 5, line 15, insert a --,-- after “turn”.

On page 5, line 18, cancel the “,” and substitute therefor a --;--.

On page 5, line 18, insert a --,-- after “e.g.”.

On page 5, line 35, cancel the “,” and substitute therefor a -- - --.

On page 5, line 38, insert --present-- before “invention”.

- On page 5, line 38, cancel the “,” and substitute therefor a --;--.
- On page 5, line 38, insert a --,-- after “particular”.
- On page 6, line 4, cancel “can”.
- On page 6, line 4, insert --can-- after “also”.
- 5 On page 6, line 26, cancel “comprise” and substitute therefor --include--.
- On page 6, line 29, cancel “are” and substitute therefor --is--.
- On page 7, line 5, insert --preferably-- after “parameters”.
- On page 7, line 6, cancel “advantageously”.
- On page 7, line 16, cancel “frequency division duplex” and substitute
- 10 therefor --Frequency Division Duplex--.
- On page 7, line 21, cancel the “,” and substitute therefor a -- - --.
- On page 7, line 25, insert --present-- before “invention”.
- On page 8, line 7, cancel “can”.
- On page 8, line 8, insert --can-- after “also”.
- 15 On page 8, line 8, cancel the “,” and substitute therefor a --;--.
- On page 8, line 8, insert a --,-- after “i.e.”.
- On page 8, line 9, cancel “can”.
- On page 8, line 9, insert --can-- after “also”.
- On page 8, line 13, insert a --,-- after “advantageous”.
- 20 On page 9, line 19, cancel “e.g.” and substitute therefor --such as--.
- On page 9, line 30, cancel the “,” and substitute therefor a --;--.
- On page 9, line 30, insert a --,-- after “e.g.”.
- On page 9, line 38, insert --present-- before “invention”.
- On page 10, line 6, cancel the “,” after “therein” and substitute therefor a --
- 25 ;--.
- On page 10, line 6, insert a --,-- after “i.e.”.
- On page 10, line 16, cancel the “-“ and substitute therefor a --(--.
- On page 10, line 17, cancel the “-“ and substitute therefor a --)--.
- On page 10, line 27, cancel the “,” and substitute therefor a --.--.

On page 10, line 28, cancel "otherwise" and substitute therefor --
Otherwise,--.

On page 10, line 34, cancel ", the" and substitute therefor --. The--.

On page 10, line 36, cancel "being" and substitute therefor --are--.

5 On page 10a, line 1, cancel "being" and substitute therefor --are--.

On page 11, line 8, cancel the ",".

On page 11, line 15, cancel "by means of" and substitute therefor --via--.

On page 11, line 15, insert a --,-- after "EE".

On page 11, line 16, insert a --,-- after "SE".

10 On page 11, after line 27, insert the following paragraph:

--Although the present invention has been described with reference to
specific embodiments, those of skill in the art will recognize that changes may be
made thereto without departing from the spirit and scope of the invention as set forth
in the hereafter appended claims.--

15 **In the Abstract:**

Please add the following Abstract:

--ABSTRACT OF THE DISCLOSURE

A method and base station for the transmission of organization
information items in a radio communications system wherein, in the radio
20 communications system, although at least one of the time slots of a frame is
provided for the transmission of organization information items, the transmission
of organization information items is suppressed at least in one of the frames by
the base station depending on a change in the quantity of information items to be
transmitted. As a result, the number of transmissions of the organization
25 information items per unit time decreases, and thus so, to, does the interference.
A small quantity of information items to be transmitted denotes situations of low
traffic load; that is to say, for example, in the domestic sector with very small
radio cells and only a small number of subscribers. The present method and base
station can be used in CDMA and TDMA transmission systems.--

In the Claims:

On page 12, cancel line 1, and substitute the following left-hand justified heading therefor:

--We Claim As Our Invention:--.

5 Please cancel claims 1-10, without prejudice, and substitute the following claims therefor:

11. A method for transmitting organization information items in the form of a point-to-multipoint connection in a radio communication system, the method comprising the steps of:

10 providing a plurality of frames respectively formed of a plurality of time slots, wherein at least one of the plurality of time slots of each frame is provided for the transmission of organization information items;

 transmitting information items from a base station to a plurality of mobile stations within the time slots of the plurality of frames; and

15 suppressing, via the base station, the transmission of the organization information items in a respective frame depending on a change in a quantity of the information items to be transmitted.

20 12. A method for transmitting organization information items as claimed in claim 11, wherein the organization information items are transmitted in a frame only when required.

13. A method for transmitting organization information items as claimed in claim 11, the method further comprising the step of:

25 determining the quantity of the information items to be transmitted relative to services and connections supplied by the base station.

14. A method for transmitting organization information items as claimed in claim 11, the method further comprising the step of:

determining the quantity of the information items to be transmitted relative to mobile stations supplied by the base station.

5

15. A method for transmitting organization information items as claimed in claim 11, the method further comprising the step of:

determining a spacing of the frames having the organization information items by a repetition rate having a value greater than one.

10

16. A method for transmitting organization information items as claimed in claim 15, the method further comprising the step of:

signaling the repetition rate used to mobile stations by the base station.

15

17. A method for transmitting organization information items as claimed in claim 11, wherein the organization information items are transmitted only upon request by a mobile station with regard to the information items to be transmitted.

20

18. A method for transmitting organization information items as claimed in claim 11, the method further comprising the step of:

transmitting useful information items in the frames having suppressed organization information items in the time slot provided for the organization information items.

25

19. A method for transmitting organization information items as claimed in claim 11, the method further comprising the step of:

providing, within a frame, a switching point between transmissions of the base station and from the mobile stations, wherein the information items are
5 transmitted according to a TDD transmission method.

20. A method for transmitting organization information items as claimed in claim 11, the method further comprising the step of:

transmitting useful information items from the base station in the frames
10 having suppressed organization information items in all slots of a frame.

21. A base station for a radio communications system, the base station comprising:

a signal conditioning device for shaping transmission signals for
15 information items to be transmitted;

a transmitting device for transmitting the transmission signals within time slots;

a frame formed from a plurality of the time slots wherein at least one of the time slots of the frame is provided for the transmission of organization information
20 items in a point-to-multipoint connection to a plurality of mobile stations; and

a control device which suppresses the transmission of the organization information items in a frame depending on a change in a quantity of the information items to be transmitted.

REMARKS

25 The present amendment makes editorial changes and corrects typographical errors in the specification in order to conform the specification to the requirements of the United States Patent practice. No new matter is added thereby. Original claims 1-10 have been canceled in favor of new claims 11-21. Claims 11-21 have been presented solely because the revisions by bracketing and underlining which

would have been necessary in claims 1-10 in order to present those claims in accordance with preferred United States Patent practice would have been too extensive, and thus would have been too burdensome. The amendment is intended for clarification purposes only and not for substantial reasons related to patentability
5 pursuant to 35 U.S.C. §§101, 102, 103 or 112. Indeed, the cancellation of claims 1-10 does not constitute an intent on the part of the Applicants to surrender any of the subject matter of claims 1-10.

Early consideration on the merits is respectfully requested.

Respectfully submitted,

10



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WO 99/67964

Description

09/720447

Method and base station for the transmission of organization information items in a radio communications system

The invention relates to a method and a base station for the transmission of organization information items in a radio communications system, in particular in a mobile radio system having broadband channels in which signals are transmitted according to a TDMA/CDMA subscriber separation method.

In radio communications systems, information (for example voice, image information, Internet messages or other data) is transmitted with the aid of electromagnetic waves via a radio interface between the transmitting and receiving radio stations (base station or mobile station). In this case, the electromagnetic waves are radiated with carrier frequencies within the frequency band provided for the respective system. Frequencies in the frequency band of approximately 2000 MHz are envisaged for future mobile radio systems having CDMA or TDMA/CDMA transmission methods via the radio interface, for example the UMTS (Universal Mobile Telecommunication System) or other 3rd generation systems.

For the transmission of organization information items, various methods are known which serve for supplying mobile stations in a radio cell of a base station with the data which are required for the radio cell. Organization information items are details regarding the radio cell, the channel structure thereof and services and options which are available in the radio cell. The organization information items are thus used by the mobile station for the synchronization and selection of the radio cell.

From the GSM mobile radio system and, for future mobile radio systems, from DE 198 10 285, it is known to provide a time slot for the transmission of

- 1a -

organization information items per frame

in the downlink direction. To that end, use is usually made of the first time slot of the frame and the information items are transmitted in radio blocks, i.e. in a burst-like manner. There are thus fixed spacings
5 between the transmissions of the organization information items, which are planned in such a way that even in unfavorable traffic load situations and with the maximum permitted speed of the mobile stations, a proper evaluation of the organization information items
10 and a handover of the mobile stations between different radio cells are supported.

Since the organization information items are usually transmitted with high and constant power, they represent a considerable source of interference within
15 the radio communications system. The effect of the interference is intensified with increasing density of the radio communications system, for example as a result of microcells and picocells. The transmission capacity of the radio communications system is
20 adversely affected.

The invention is based on the object of specifying a method and a base station which reduce the interference within the radio communications system. This object is achieved by means of the method having
25 the features of claim 1 and the base station having the features of claim 10. Advantageous developments can be gathered from the subclaims.

According to the invention, in the radio communications system, although at least one of the
30 time slots of a frame is provided for the transmission of organization information items, the transmission of organization information items is suppressed at least in one of the frames by the base station depending on a change in the quantity of information items to be
35 transmitted.

As a result, the number of transmissions of the organization information items per unit time decreases, and thus so, too, does the interference.

A small quantity of information items to be transmitted denotes situations of low traffic load, that is to say e.g. in the domestic sector with very small radio cells and only a small number of subscribers. Such situations are regularly accompanied by a low degree of mobility and/or alteration of the conditions for the radio interface between the mobile stations and the base station. In these cases, the suppression of the transmission of the organization information items as provided according to the invention does not constitute a restriction for the mobile stations. The advantages of interference reduction predominate. In this case, the information can be transmitted in radio blocks, i.e. according to a discontinuous-time TDMA subscriber separation method, or continuously, e.g. according to CDMA subscriber separation methods.

According to refinements of the invention, the quantity of information items to be transmitted is determined relative to mobile stations or connections supplied by the base station. The fewer mobile stations which stay or are currently active in the radio cell and transmit and receive information, the less critical it is to effect continual supply with organization information items. The quantity of information items to be transmitted changes when new subscribers are logged on or subscribers log out. A further case is the change in a service for existing connections, e.g. when switching to a higher-rate service.

The spacing of the frames having organization information items is advantageously determined by a repetition rate having a value greater than one. The repetition rate can be set to two, three or higher values. Thus, at least one frame remains without organization information items. The repetition rate used is advantageously signaled to mobile stations by the base station, so that other information items, e.g. useful information items, can also be transmitted in the time slots liberated.

According to an alternative instance of the invention, the organization information items are transmitted only on request by a mobile station. Such a request is transmitted in the uplink direction when the mobile station wishes to use radio resources in order to effect transmission itself or to set up a traffic relationship with a base station for the interrogation of information. The transmission of organization information items can be dispensed with for the rest of the time.

A particular application of the invention is in radio communications systems in which a switching point between transmissions of the base station and from mobile stations is provided within a frame, so that the information items are transmitted according to a TDD transmission method (TDD time division duplex). Such a radio communications system is suitable for the operation of microcells, e.g. in the unlicensed domestic sector, and, as a result of shifting the switching point, can also provide asymmetrical data services, e.g. for supporting the Internet, without wasting radio resources. By suppressing the organization information items at least occasionally, useful information items can be transmitted from the base station in the frames having suppressed organization information items in all time slots of a frame. This increases the maximum data rate available, which, in the extreme case, can be utilized solely in one transmission direction.

The invention is explained in more detail below using exemplary embodiments with reference to illustrations in the drawings.

In the figures:

- Figure 1 shows a block diagram of a mobile radio system,
- Figure 2 shows a schematic illustration of the frame structure of the TDD transmission method,
- Figures 3 - 6 show schematic illustrations of a

- 4a -

variable channel structure for
organization information items,

Figure 7 shows a schematic illustration of the transmission of organization information items when required,

Figure 8 shows a flow diagram of the transmission of organization information items, and

Figure 9 shows a simplified block diagram of a base station.

The mobile radio system illustrated in Figure 1 as an example of a radio communications system comprises a multiplicity of mobile switching centers MSC which are internetworked and establish access to a fixed network PSTN. Furthermore, these mobile switching centers MSC are each connected to at least one device RNM for allocation of radio resources. Each of these devices RNM in turn enables a connection to at least one base station BS. Such a base station BS can set up a connection, via a radio interface, to further radio stations, e.g. mobile stations MS or other mobile and stationary terminals. At least one radio cell Z is formed by each base station BS. In addition, a plurality of radio cells Z are supplied per installed base station BS in the event of sectorization or with hierarchical cell structures. The device RNM for the allocation of radio resources and a plurality of base stations BS form a base station system.

Figure 1 illustrates connections V, designated by way of example as V1, V2, Vk, for transmitting useful information items ni and signaling information items si between mobile stations MS and a base station BS. The transmission of organization information items oi is effected to a plurality of mobile stations MS in the form of a point-to-multipoint connection.

An operation and maintenance center OMC realizes monitoring and maintenance functions for the mobile radio system, or for parts of it. The functionality of this structure can be transferred to other radio communications systems in which the invention can be used, in particular for subscriber

access networks with wire-free subscriber access. Base stations which are used as home base stations in the private sector, without being affected by the radio network planning, can also set up connections to mobile stations MS. These home base stations are connected to a fixed network.

A frame structure for radio transmission can be seen in Figure 2. Based on a TDMA component, a broadband frequency range, for example with a bandwidth $B = 5$ MHz, is split into a plurality of time slots ts having the same time duration, for example 16 time slots ts_0 to ts_{15} . Some of the time slots ts_0 to ts_9 are used in the downlink direction DL, and some of the time slots ts_{10} to ts_{15} are used in the uplink direction UL. In between, there is a switching point SP. In this TDD transmission method, the frequency band for the uplink direction UL corresponds to the frequency band for the downlink direction DL. The same applies to further carrier frequencies.

Within a time slot which is provided for the transmission of information items oi , si , ni , information items for a plurality of connections are transmitted in radio blocks. Alternative exemplary embodiments provide continuous-time transmission of the information items oi , si , ni . The aforementioned radio blocks for useful data transmission comprise sections with data d , in which training sequences $tseq_1$ to $tseq_n$, which are known at the receiving end, are embedded. The data d are spread on a connection-specific basis with a fine structure, a subscriber code c , so that, for example, n connections can be separated at the receiving end by this CDMA component.

The spreading of individual symbols in the data d results in Q chips of duration T_{chip} being transmitted within the symbol duration T_{sym} . The Q chips in this case form the connection-specific subscriber code c . Furthermore, the time slot ts includes a guard time gp to compensate for different signal propagation times of the connections.

Within a broadband frequency range B, the successive time slots ts are organized according to a frame structure. Thus, 16 time slots ts are combined to form a frame fr .

5 The radio interface parameters used are advantageously:

| | |
|-------------------------------|-------------|
| Chip rate: | 4096 Mcps |
| Frame duration: | 10 ms |
| Number of time slots: | 16 |
| 10 Duration of a time slot: | 625 μ s |
| Spread factor: | 16 |
| Modulation type: | QPSK |
| Bandwidth: | 5 MHz |
| Frequency repetition value: | 1 |

15 These parameters allow the best possible harmonization with an FDD (frequency division duplex) mode for the 3rd mobile radio generation. The switching point SP is advantageously chosen to be identical within a group of cells.

20 Figure 3 once again shows the known frame structure, organization information items oi in each case being transmitted in the first time slot of a frame. In the remaining time slots, useful information items ni are transmitted in the uplink UL or downlink
25 DL direction. The invention departs from this rigid scheme in accordance with the frame structures as shown in Figures 4 to 6, the suppression of the transmission of organization information items oi being dependent on a change in the quantity of information items oi , si ,
30 ni to be transmitted.

 According to Figure 4, the splitting of the frame fr in the uplink UL and downlink DL direction is preserved, but a time slot is used for transmitting the organization information items oi only in every second
35 frame fr . A repetition rate rr is equal to two in this case. It is optionally also possible to

choose a repetition rate rr of three or four. The interference caused by the transmission of the organization information items oi , which have to be transmitted with high and fixedly prescribed power, is reduced to a value which is proportional to the reciprocal of the repetition rate rr .

Figure 5 shows that the repetition rate rr can also be less than one, i.e. organization information items oi can also be transmitted repeatedly per frame fr . This is done in the first and last time slots of part of the frame fr which is provided for the downlink direction DL . This low repetition rate rr is advantageous particularly in radio cells having fast alterations of the transmission conditions for the mobile stations MS and many handovers to adjacent cells.

Figure 6 is also an example of a repetition rate rr of two, the splitting in the uplink UL and downlink DL direction additionally having been cancelled at least for some frames fr . In order to obtain very high data rates in the downlink direction DL , for example, one complete frame fr is reserved for the transmission in the downlink direction DL ; organization information items oi and useful information items ni are transmitted only in one transmission direction. The switching point SP within the frame fr is obviated. Consequently, it is also possible to support an extremely asymmetrical information transmission, which is required in Internet applications, for example.

Figure 7 shows a case in which the transmission of the organization information items oi depends directly on the quantity of information items oi , si , ni to be transmitted. The situation is shown whereby only one mobile station MS is assigned to a base station BS in the domestic sector. A connection is not presently set up to this mobile station MS . No organization information items oi are transmitted in the first frame fr illustrated. Since there is no radio

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traffic at all between

[illegible]

base station BS and mobile station MS, no interference occurs for adjacent radio cells.

However, if the subscriber to which the mobile station MS is assigned would like to establish a connection, then the mobile station MS uses a radio block containing signaling information items si, in a time slot of the second frame fr, to request the base station BS to transmit the organization information items oi. This is done in the subsequent frame fr. The mobile station MS can be synchronized with the organization information items oi and thereupon transmit useful information items ni in the uplink direction UL.

In the exemplary embodiment according to Figure 7, the organization information items oi are transmitted only when required. The physical transmission of a high-frequency signal in a time slot is performed only if beforehand a mobile station MS has transmitted such a request, e.g. an access block (access burst), or a timer has elapsed indicating that no organization information items oi have been transmitted for a specific period of time.

This method is suitable in radio communications systems having a multiplicity of uncoordinated base stations BS, in which the transmission power that is radiated in total is distinctly reduced and that the interference for base and mobile stations in adjacent cells decreases. The interference reduction is particularly important for radio communications systems having low frequency repetition values, e.g. a frequency repetition value of one. Furthermore, the interference reduction is particularly significant in the case of a TDD transmission method, in which the traffic in the uplink UL and downlink DL direction arises in the same frequency band B, if appropriate with a variable switching point SP from radio cell to radio cell.

The transmission - according to the invention - of organization information items oi which contributes

- 9a -

to interference reduction is

[illegible]

illustrated schematically in Figure 8. In a first step, information items oi , si , ni are transmitted by means of a TDMA/CDMA subscriber separation method. In a second step, the base station BS or another network device determines the quantity of information items oi , si , ni to be transmitted and the change therein, i.e. logging in or out of mobile stations MS or a change in the supported services. This is done for the uplink direction UL - Figure 7 - and for the uplink and downlink directions UL, DL - Figures 4 to 6.

In a third step, the quantity of information items oi , si , ni to be transmitted is compared with a threshold value. In this case, as variables representing the quantity, it is possible to use the number of mobile stations MS or connections to be supplied, the data rate to be transmitted or - see Figure 7 - as the smallest unit, a request for resource allocation. If the threshold value is not exceeded, then the information transmission is continued with the same repetition rate rr of the organization information items oi .

If the threshold value is exceeded, then an interrogation is made in a fourth step to determine whether the quantity of information items oi , si , ni to be transmitted is increased or decreased. If a larger quantity of information is to be transmitted, then the repetition rate rr is reduced in a fifth step, otherwise the repetition rate rr is increased in a sixth step. The information transmission is continued with the structure of the transmission of the organization information items oi which is defined by the repetition rate rr .

The information transmission is carried out in a base station BS according to Figure 9, the administration of the switching point SP and details for the offered services being influenced by the organization and maintenance center OMC and the stipulations of the device RNM for the allocation of

radio resources being taken into consideration. The
base station BS

contains a transmitting/receiving part TX/RX for high-frequency processing of transmission and reception signals.

Furthermore, a transmitting device SE and a
5 receiving device EE are connected to the
transmitting/receiving part TX/RX. In the transmitting
device SE, the signals are subjected to digital/analog
conversion, and converted from baseband to the
frequency range for radiation, and the transmission
10 signals are modulated. A signal conditioning device SA
has previously compiled the information items oi, si,
ni to be transmitted in radio blocks and assigned them
to the corresponding frequency band and time slot. A
signal processing device DSP evaluates signals that are
15 processed by means of the receiving device EE in a
manner corresponding to the transmitting device SE and
carries out channel estimation and data detection.

The interaction of the components, the setting
of the switching point SP and the assignment of the
organization information items oi to the time slots are
20 controlled by a control device ST. Associated data
relating to the transmission and switching point SP,
the specific characteristics of the connections and the
scheme for transmitting the organization information
25 items oi are stored in a memory device MEM. The scheme
is updated in accordance with the quantity of
information items oi, si, ni to be transmitted.

Patent claims

1. A method for the transmission of organization
information items (oi) in a radio communications
5 system, in which
information items (ni, si, oi) are transmitted from a
base station (BS) within time slots (ts), a plurality
of time slots (ts) forming a frame (fr) and at least
one of the time slots (ts) of the frame (fr) being
10 provided for the transmission of organization
information items (oi),
characterized
in that the base station (BS) suppresses the
transmission of organization information items (oi) in
15 a frame (fr) depending on a change in the quantity of
information items (ni, si, oi) to be transmitted.
2. The method as claimed in claim 1, characterized
in that the quantity of information items (ni, si, oi)
to be transmitted is determined relative to services or
20 connections (V) supplied by the base station (BS).
3. The method as claimed in claim 1 or 2,
characterized in that the quantity of information items
(ni, si, oi) to be transmitted is determined relative
to mobile stations (MS) supplied by the base station
25 (BS).
4. The method as claimed in one of the preceding
claims, characterized in that the spacing of the frames
(fr) having organization information items (oi) is
determined by a repetition rate (rr) having a value
30 greater than one.
5. The method as claimed in claim 4, characterized
in that the repetition rate (rr) used is signaled to
mobile stations (MS) by the base station (BS).
6. The method as claimed in one of the preceding
35 claims, characterized in that organization information
items (oi) are

transmitted only upon request by a mobile station (MS) with regard to information items (ni, si) to be transmitted.

7. The method as claimed in one of the preceding claims, characterized in that useful information items (ni) are transmitted in the frames (fr) having suppressed organization information items (oi) in the time slot (ts) provided for the organization information items (oi).

8. The method as claimed in one of the preceding claims, characterized in that a switching point (SP) between transmissions of the base station (BS) and from mobile stations (MS) is provided within a frame (fr), with the result that the information items (ni, si, oi) are transmitted according to a TDD transmission method.

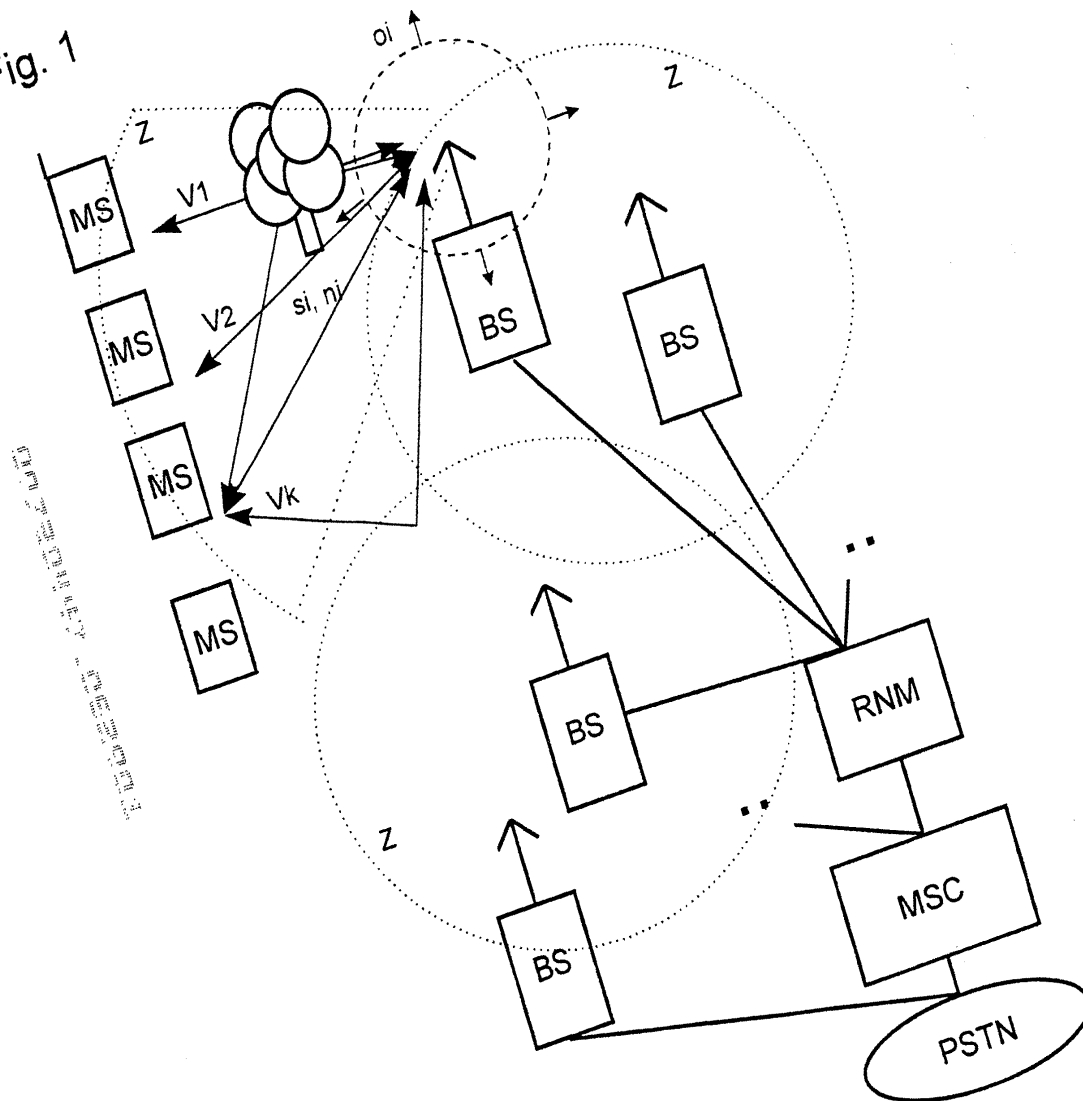
9. The method as claimed in one of the preceding claims, characterized in that useful information items (ni) are transmitted from the base station (BS) in the frames (fr) having suppressed organization information items (oi) in all time slots (ts) of a frame.

10. A base station (BS) for a radio communications system, having a signal conditioning device (SA) for shaping transmission signals for information items (ni, si, oi) to be transmitted, having a transmitting device (SE) for transmitting the transmission signals within time slots (ts), a plurality of time slots (ts) forming a frame (fr) and at least one of the time slots (ts) of the frame (fr) being provided for the transmission of organization information items (oi), characterized by

a control device (ST), which suppresses the transmission of organization information items (oi) in a frame (fr) depending on a change in the quantity of information items (ni, si, oi) to be transmitted.

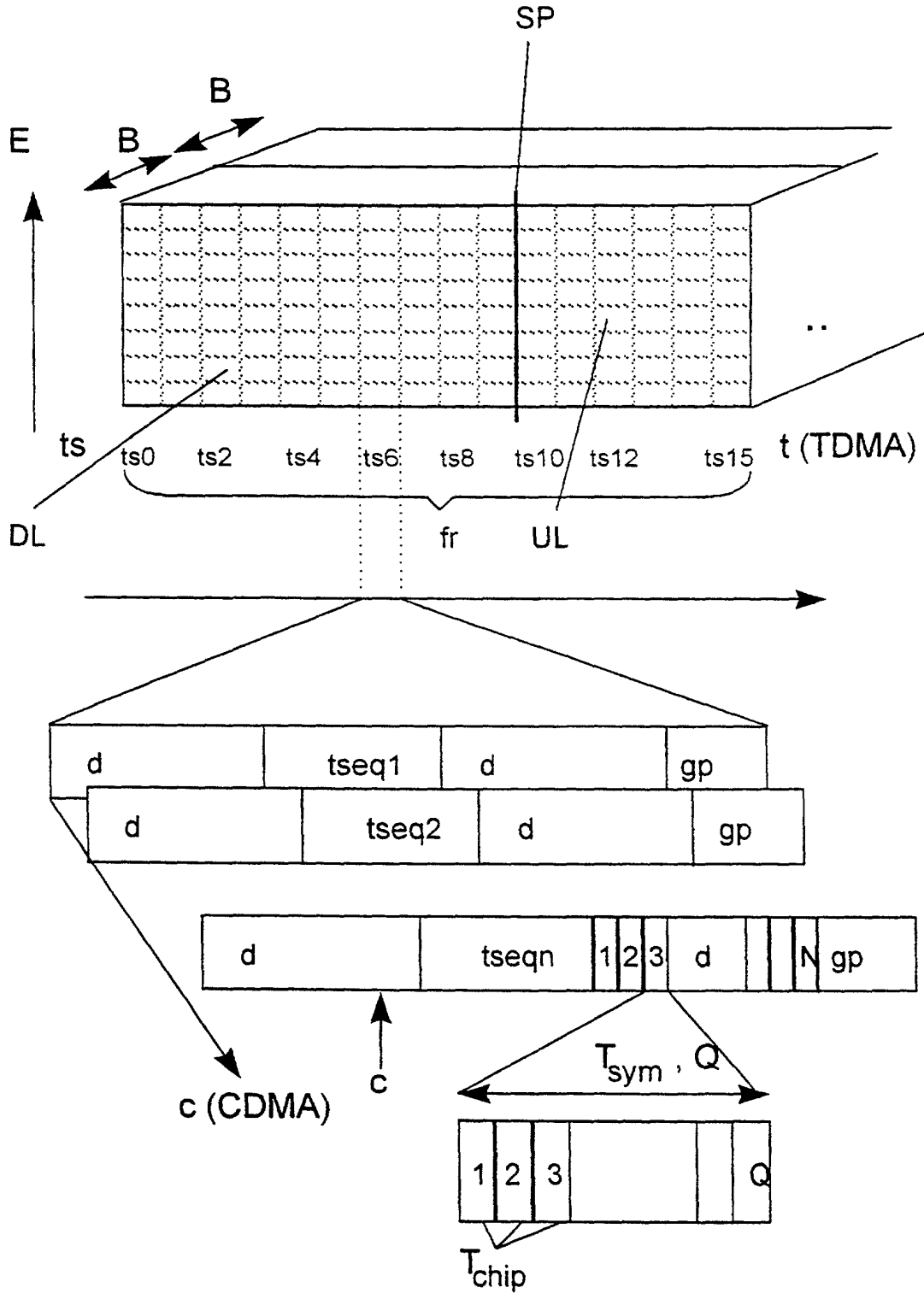
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Fig. 1



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Fig. 2



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Fig. 3

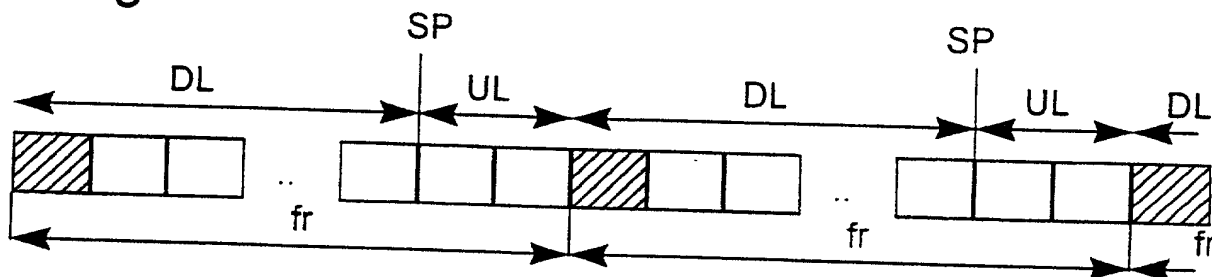


Fig. 4

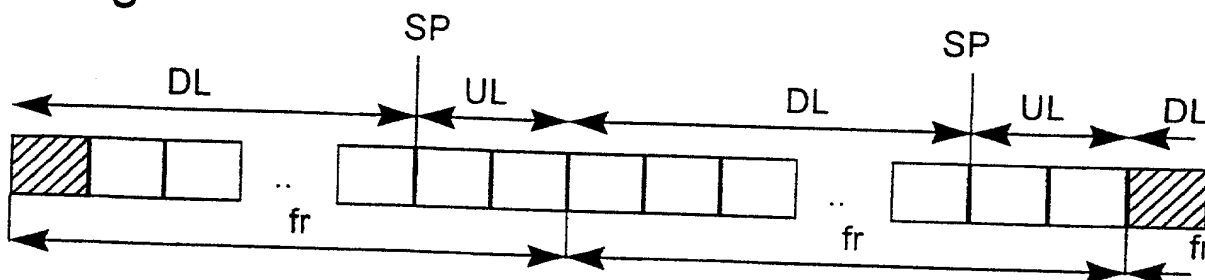


Fig. 5

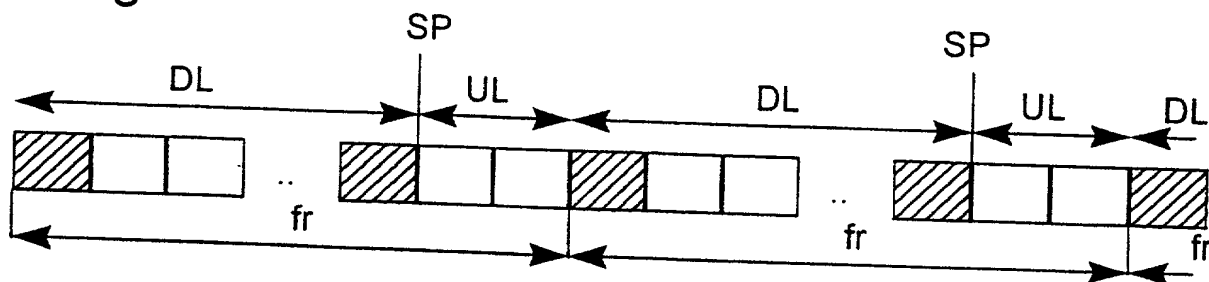
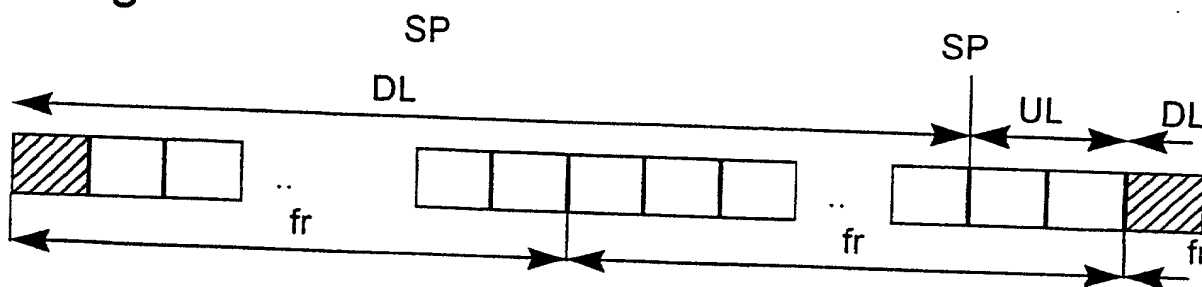


Fig. 6



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Fig. 7

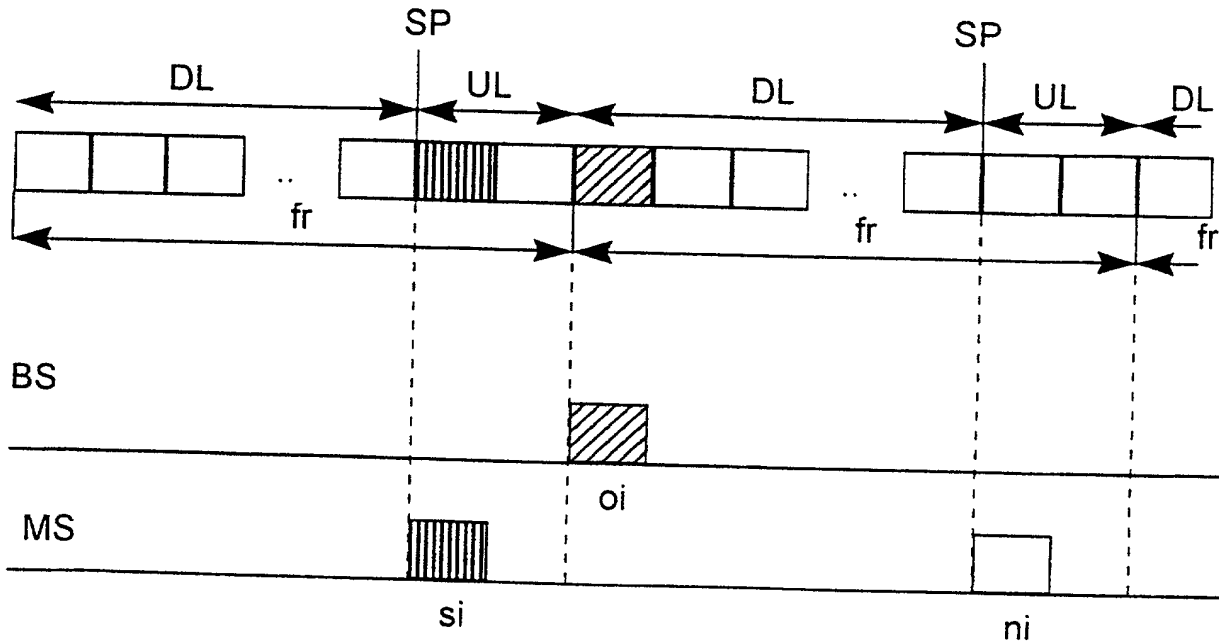
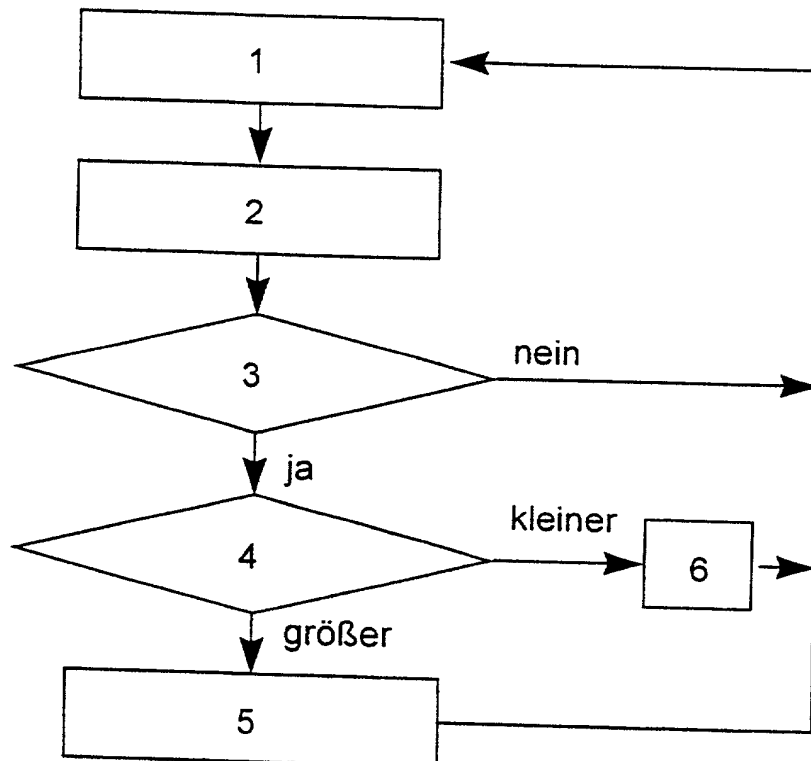
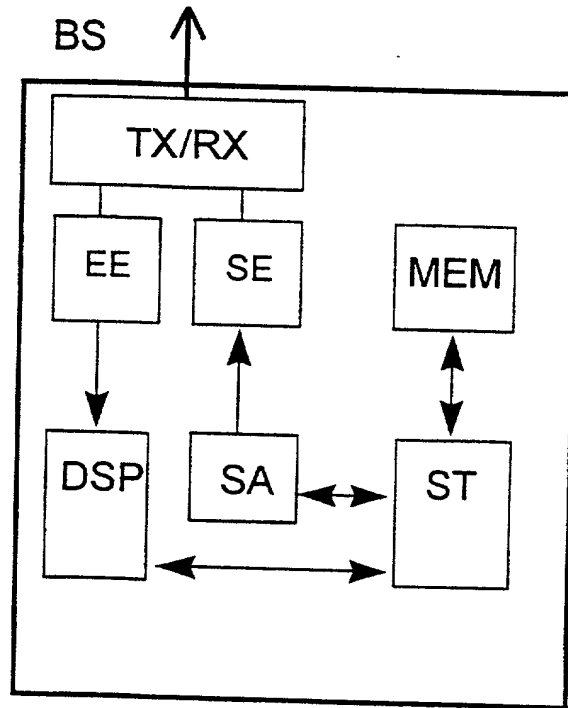


Fig. 8



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Fig. 9



COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY

(Includes Reference to PCT International Applications) PCT/DE99/01219

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As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.
I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

METHOD AND BASE STATION FOR THE TRANSMISSION OF ORGANIZATION INFORMATION IN A RADIO COMMUNICATIONS SYSTEM

the specification of which (check only one item below):

☐ is attached hereto.☒ was filed as United States applicationSerial No. 09/720,447on December 22, 2000

and was amended

on _____ (if applicable).

☐ was filed as PCT international application

Number _____

on _____

and was amended under PCT Article 19

on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

| COUNTRY (if PCT indicate "PCT") | APPLICATION NUMBER | DATE OF FILING (day, month, year) | PRIORITY CLAIMED UNDER 35 USC 119 |
|------------------------------------|--------------------|--------------------------------------|---|
| Germany | 198 27 700.8 | 22 June 1998 | <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO |
| | | | <input type="checkbox"/> YES <input type="checkbox"/> NO |
| | | | <input type="checkbox"/> YES <input type="checkbox"/> NO |
| | | | <input type="checkbox"/> YES <input type="checkbox"/> NO |
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

SIGNATURE OF INVENTOR 201

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SIGNATURE OF INVENTOR 203

DATE 28 May 01

DATE 11.06.01

DATE Apr. 5, 2001

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23/04/2001

DATE

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03/04/2001